



Simulation meeting

<http://www-cdf.lbl.gov/~currat/talks/>

Charles Currat
LBNL

August 29, 2002

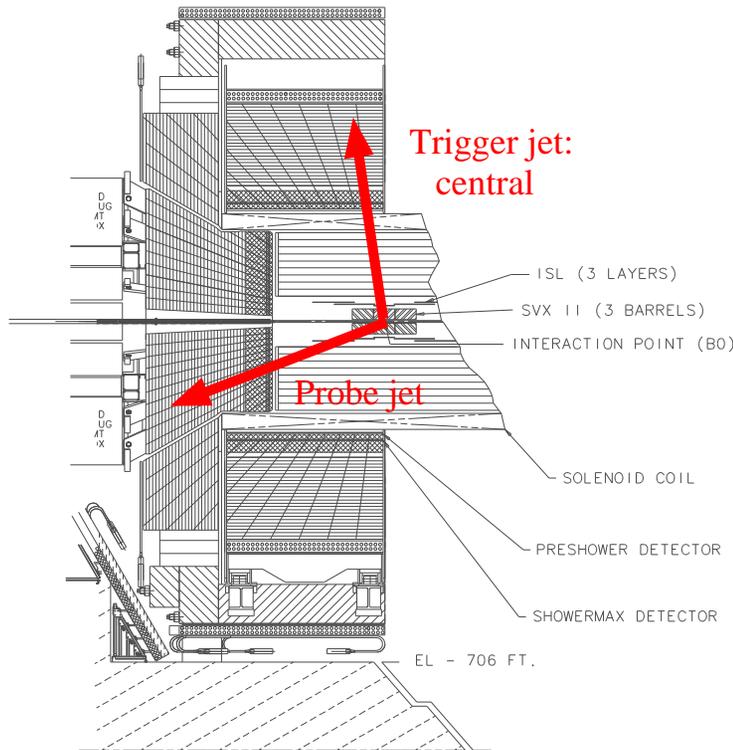
- ❖ Comparison data/MC with jets: cracks & plug energy scale
- ❖ Treatment of z-vertex in simulation



Dijet balancing



See e.g. CDF note #1513



$$MPF = \frac{p_T^{probe} - p_T^{trigger}}{\frac{1}{2} \cdot (p_T^{probe} + p_T^{trigger})}$$

JET_20 sample ($R_{cone} = 0.7$)

❖ $|z\text{-vertex}| < 60 \text{ cm}$ (FastZvertex)

❖ E_T trigger jet $> 22 \text{ GeV}$

❖ $0.2 < |\eta_{trig}| < 0.8$

❖ E_T 3rd jet $< 10 \text{ GeV}$

❖ $\frac{E_T(j_3)}{\frac{1}{2}(E_T(j_{trig}) + E_T(j_{prob}))} < 0.25$

❖ $\Sigma E_T(j, j) > 2 \cdot E_T(j_{trig}) + 15 \text{ GeV}$

❖ $\Delta\phi(j, j) > 2.7$

Probe jet randomly assigned when both jets are central



Comparison data/MC: samples

❖ data:

- gjet01 sample (stripped) Feb-June 2002
- runs # 138425–145200 (~ 2 M events)
- no PPR correction (gjet03 does have it)
- JET_20 trigger path applied
- GOOD RUNS selection according to QCD group

❖ MC:

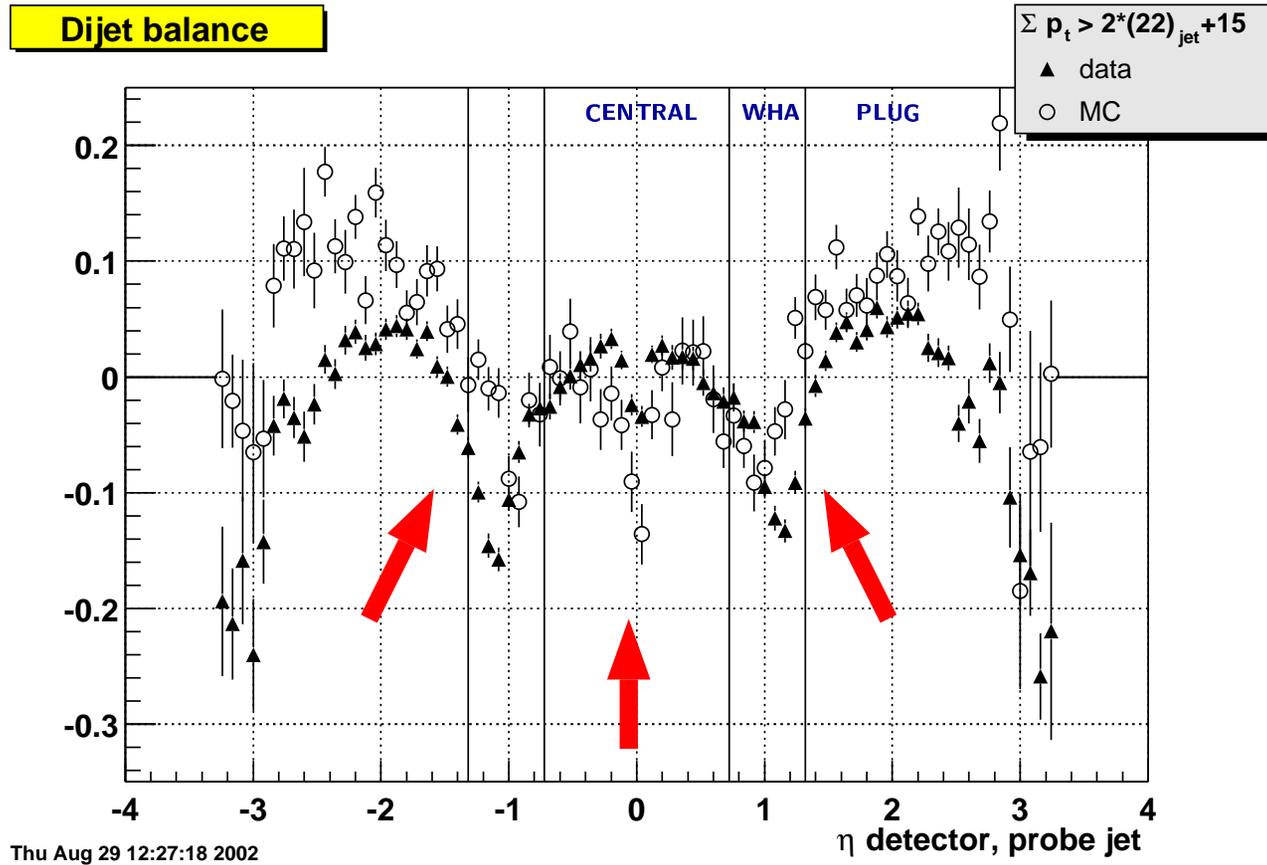
- QCD $2 \rightarrow 2$ hard parton scattering
- $p_T > 20$ GeV cut at parton level
- run # 85890 (~ 600 k events)

❖ Code: samples processed with CdfSim v4.5.3



Comparison data/MC: dijet balance (1)

☞ Σp_T cut to stand away from (possible) trigger bias



Stats data: 41210 entries / 2M events

☞ Cracks / Plug+WHA E-scale ?!

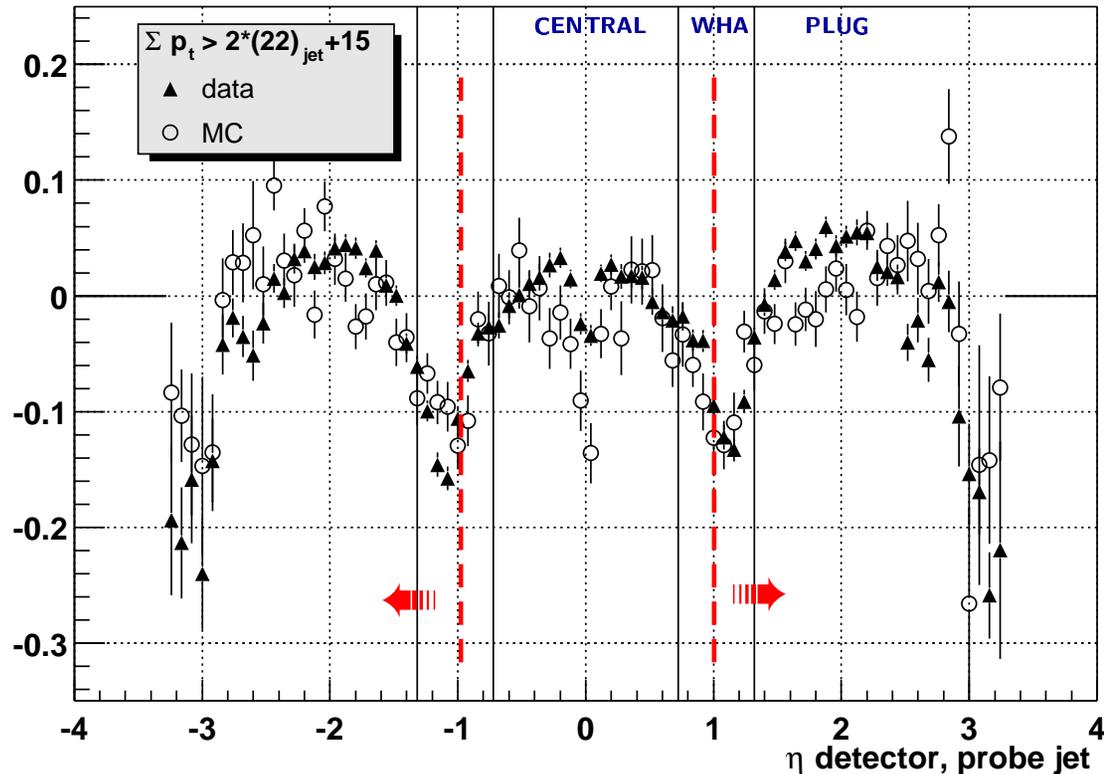


Comparison data/MC: dijet balance (2)



Correction “by hand”: $0.92 \times E_T(\text{probe})$ for $|\eta| > 1$

Dijet balance



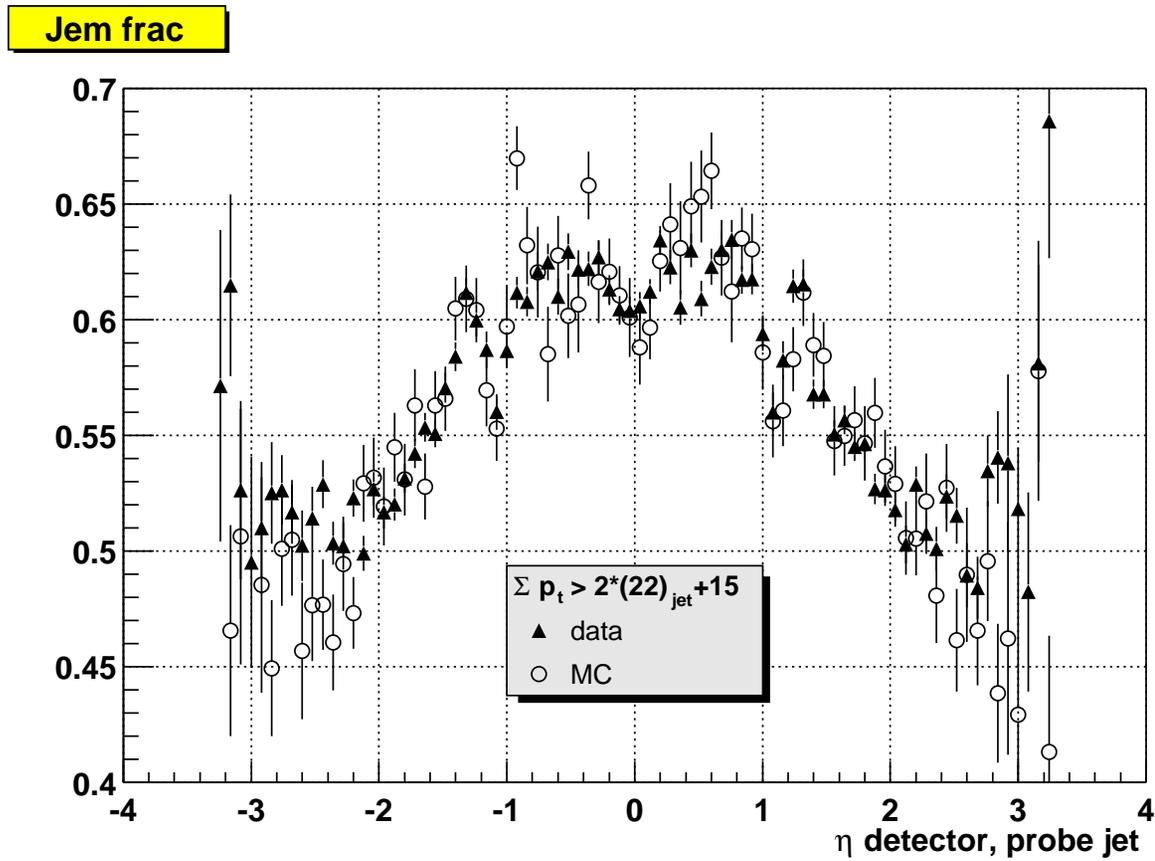
- ❖ WHA+plug in agreement within statistics so far
- ❖ $10\times$ more MC events to be requested ... once z-vertex tuned in simulation (see next)



Comparison data/MC: EM fraction



Jet EM fraction in agreement right “out of the box” ...



👉 note that 90°-crack is OK

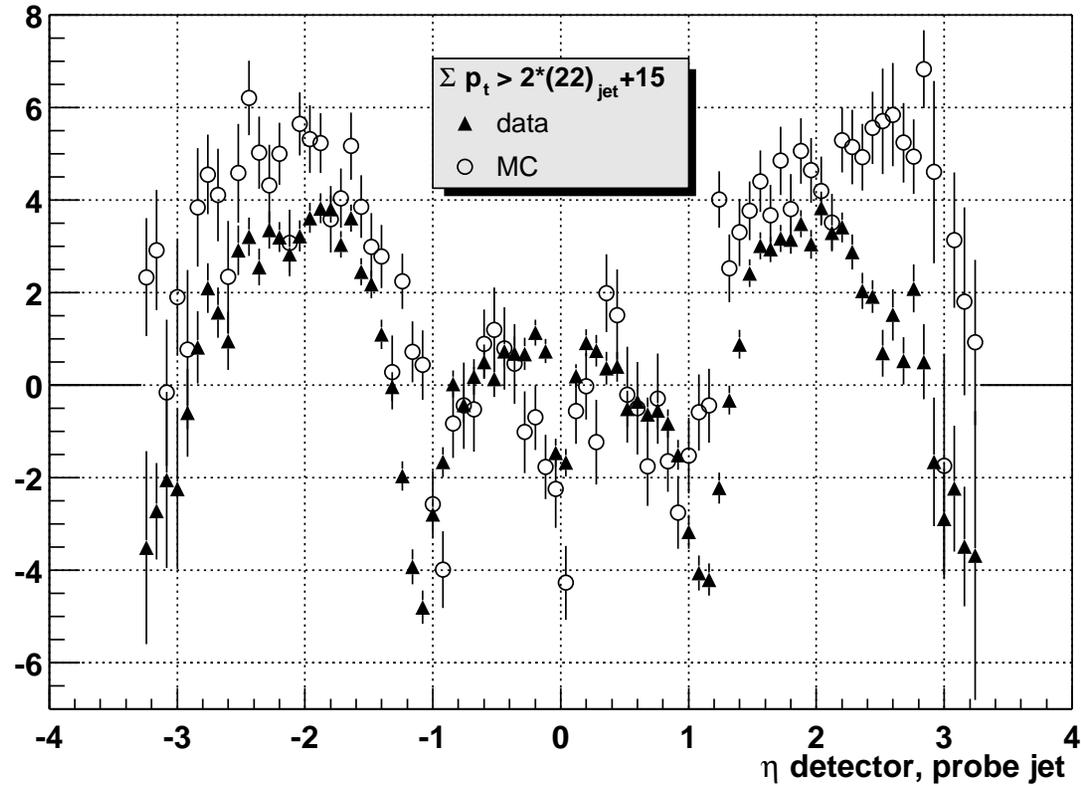


Comparison data/MC: missing E_T



Missing E_T projection onto the probe jet axis

mEt proj



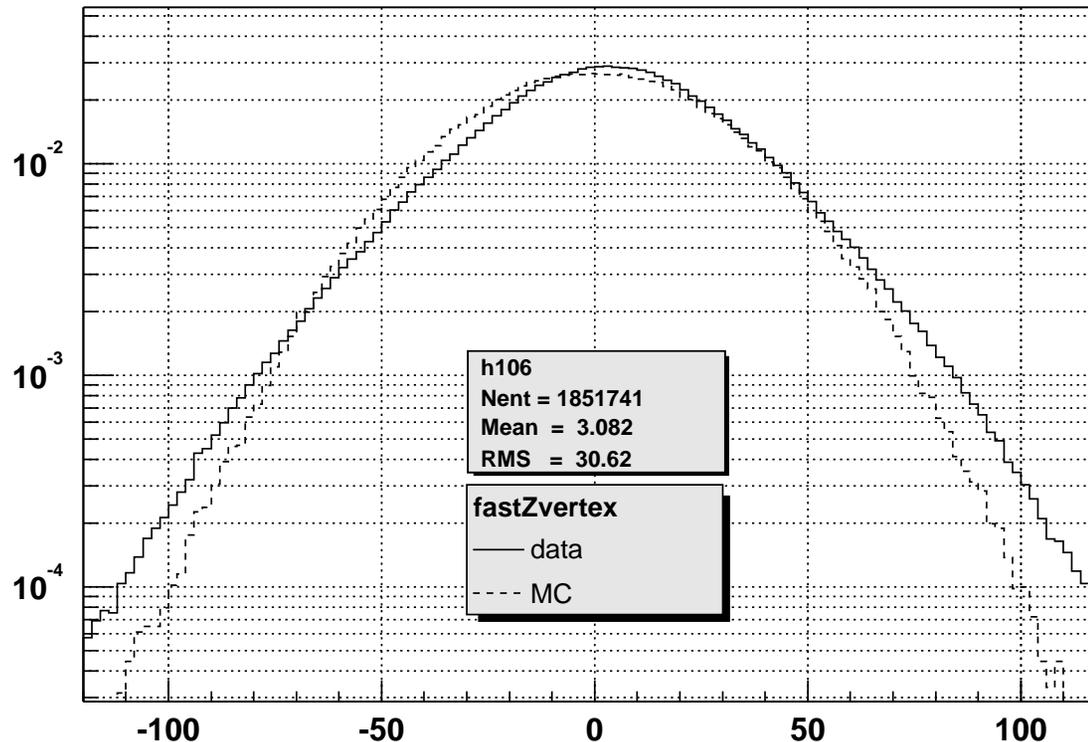
➡ Same symptom (plug+WHA) as for “raw” dijet balance



Comparison data/MC: z-vertex (1)

FastZvertex (strategy 3): $\langle z \rangle \simeq +3$ cm in the data ...

fastz



Thu Aug 29 15:41:28 2002

👉 Need to be taken into account at some point in the simulation

Question: how come $z > 100$ cm evts are so well reconstructed (no more detector) ?

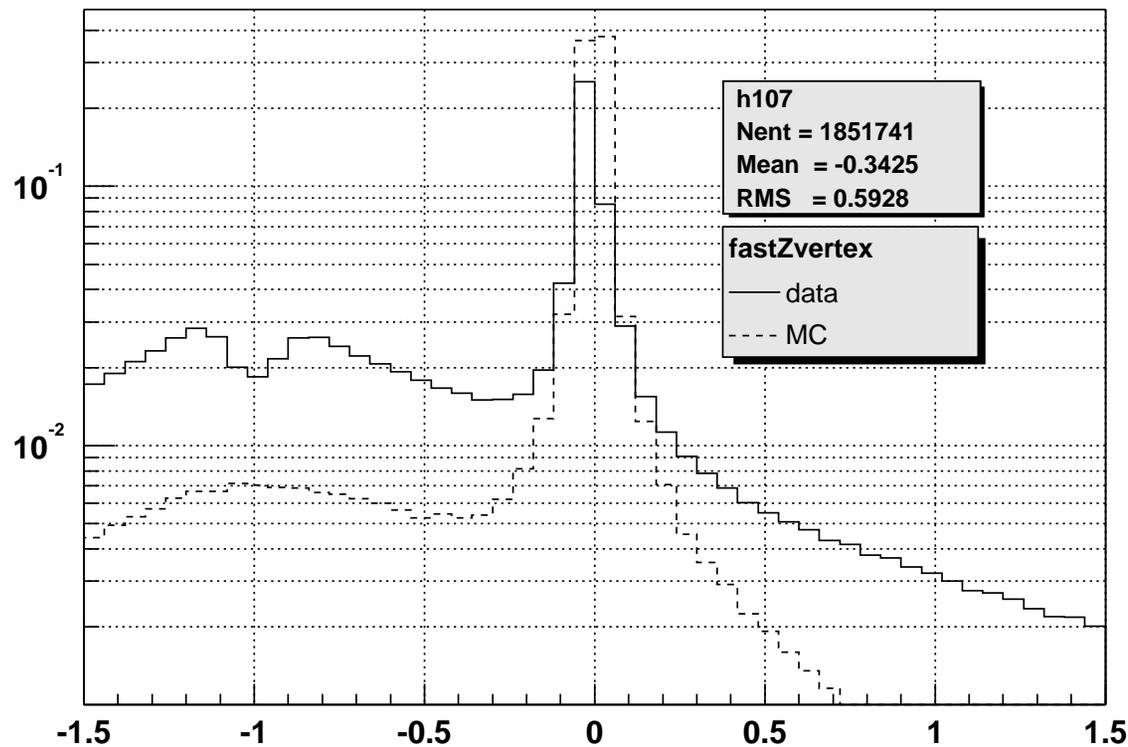


Comparison data/MC: z-vertex (2)

$\frac{z(vxprim) - z(COT)}{|z(COT)|}$ when both methods succeed. NB:

$\epsilon(vxprim) \sim 50\%$
 $\epsilon(COT) > 90\%$

z_ov_fastz



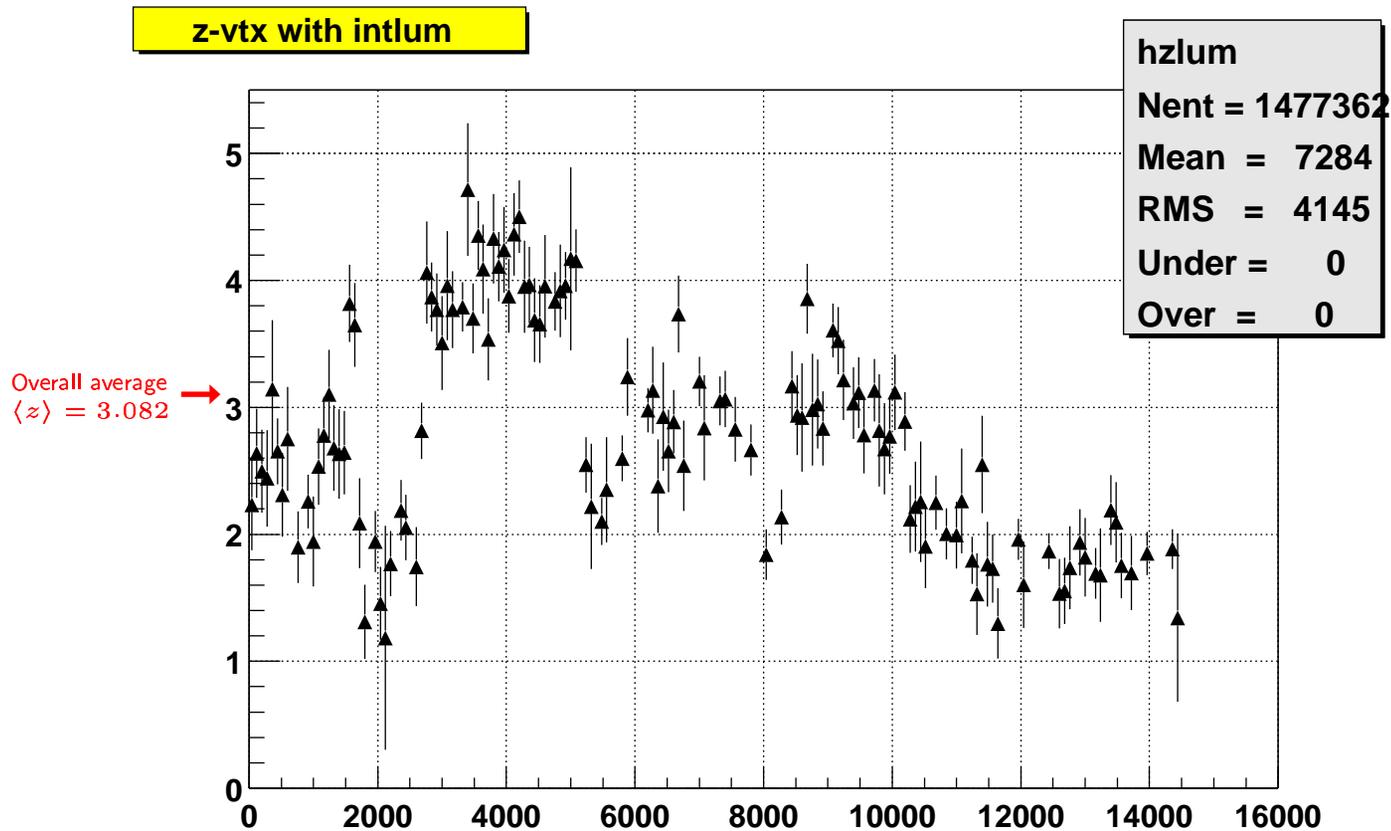
Thu Aug 29 15:41:28 2002

- ❖ Where does this asymmetry come from ?
- ❖ Efficiencies differ (MC is better)



Comparison data/MC: z-vertex (3)

Average z-vertex position [cm] per run as function of integrated luminosity [nb^{-1}]



👉 Question: what to implement in CdfSim ?! A “z-vertex” parameter in the talk-to looks scary ...